HOSPITAL INFORMATION SYSTEMS IN BULGARIA - 20 YEARS OF EXPERIENCE

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Abstract

This paper is devoted to one very exotic, strange at first sight and unusual approach for historical investigation of information systems (IS) in medicine and healthcare in Bulgaria. Our purpose is to explore and make a research, based on 20 years old evaluation scheme for health and medical information systems, and to evaluate the newest and most famous in Bulgarian medical practice developed hospital software systems.

Introduction

The first hospital information systems in Bulgaria appeared in the late 60 of the past century, and they were oriented to the administrative and economic functions. In the middle 70 except the administrative functions are automated the communications inside the hospital, the management of the diagnostic process, the intensive sectors, clinical laboratories and the drug supplying. There are four well-defined main spheres of HIS in Bulgaria: hospital management, management of medical and diagnostic processes, research and management of the healthcare in the municipality. Afterwards is developed the tendencies for integration of the local HIS in an unique information network for national management of the healthcare system.

In 1987 a scientific group developed a detailed multifunctional scheme with the following evaluation types of IS in healthcare and medicine:

- ✓ Quantity characteristics
- ✓ Evaluation of the entrance
- ✓ Evaluation of the exit and interconnections
- ✓ Simplified evaluation scheme

Method essence

On these base we have adapted the Simplified evaluation scheme, which was approved and applied for evaluation of the MIS in the period 86-93 [1] and choose to rate 15 working IS in Bulgaria, and more precisely: 3 Hospital Information Systems, 3 IS for Occupational Health Services, 3 dental IS, 3 laboratory IS and 3 pharmacy IS. These are the best developed medical informatics trends in Bulgarian healthcare.

On the pictures below we have demonstrated systems screenshots, but to all of the 15, because there are restrictions and user rights for publishing information.

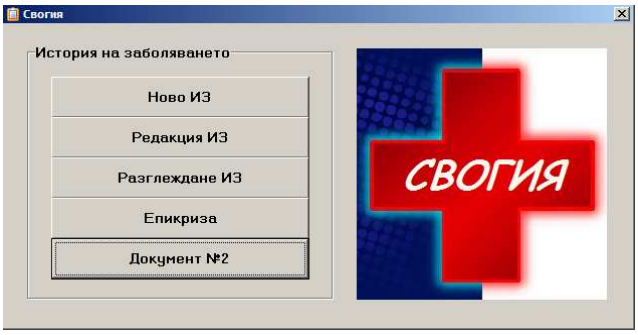


Fig.1. HIS Svogija [4]

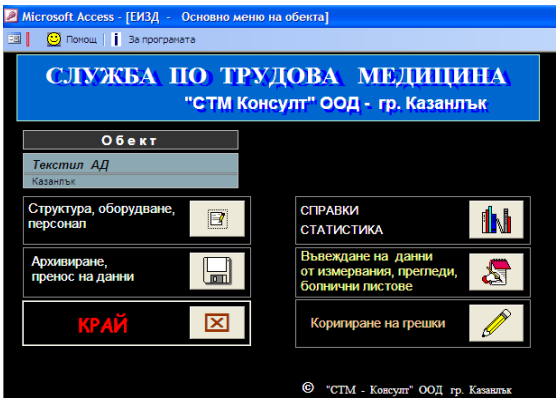


Fig.2. STM Consult

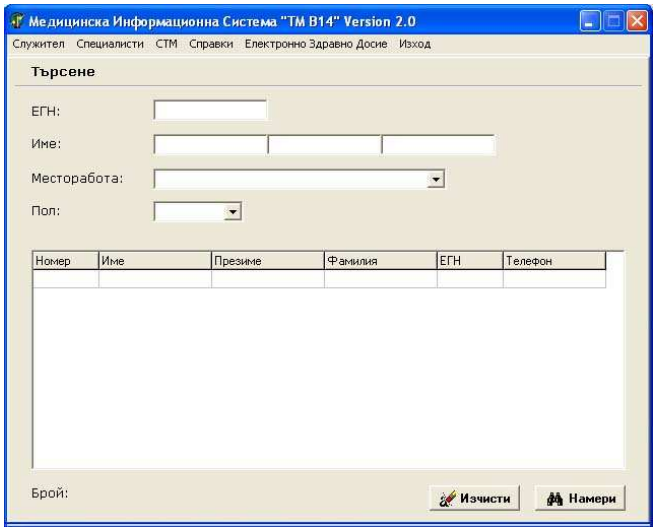


Fig.3. DASIAN [18]

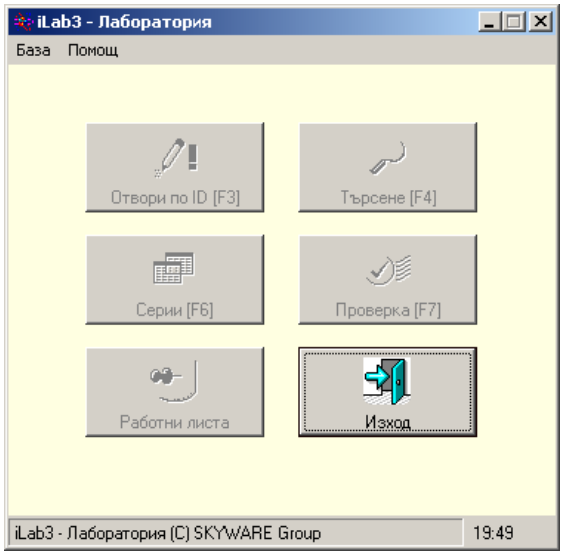


Fig.4. iLab 3 [12]

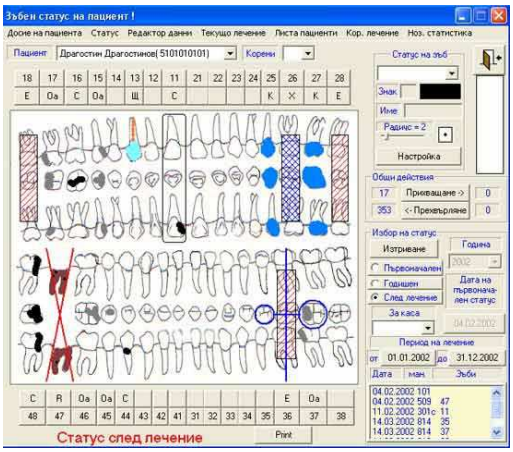


Fig.5. Profi

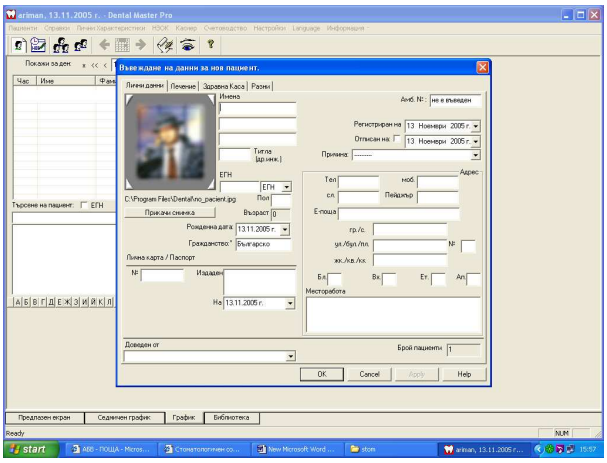


Fig.6. Dental Master Pro[10]

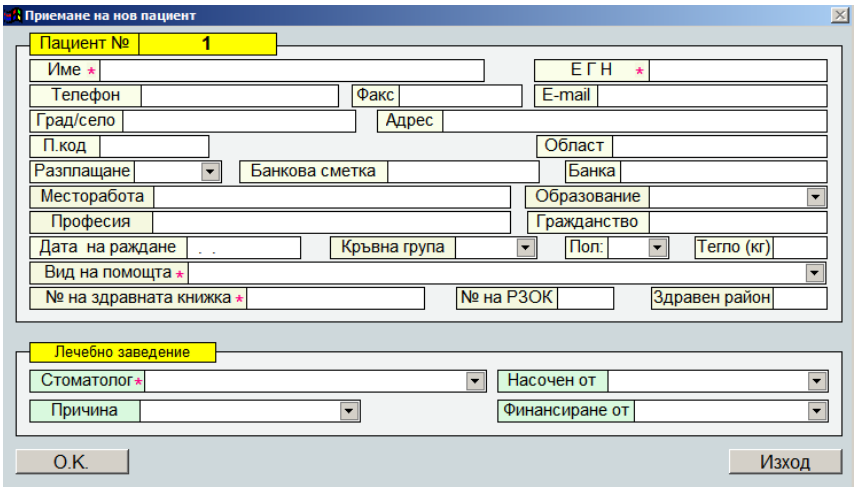


Fig.7. Dentist 2005

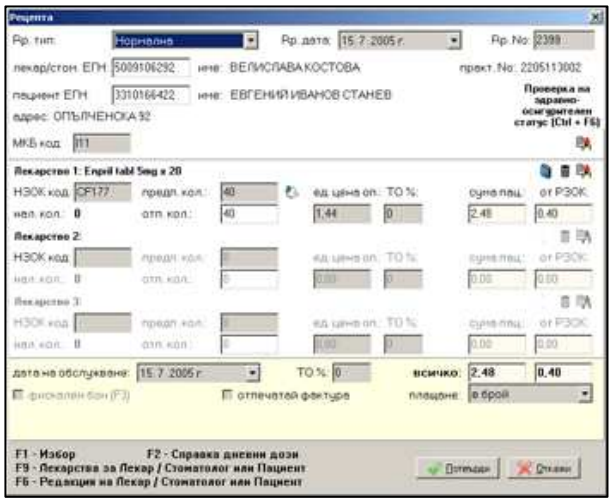


Fig.8. Libra [15]

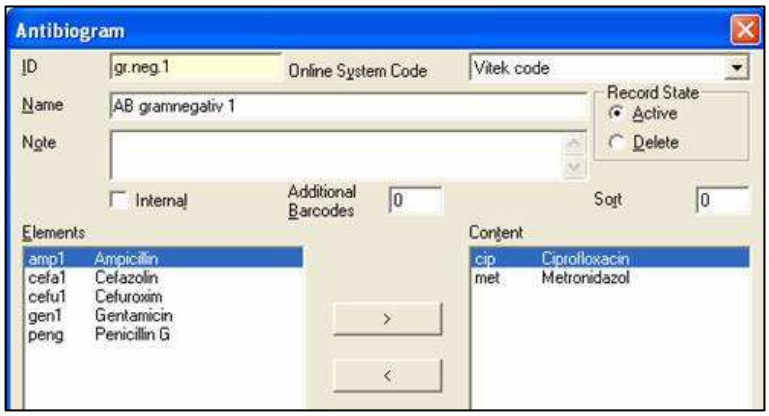


Fig.9. MSMeLab [14]

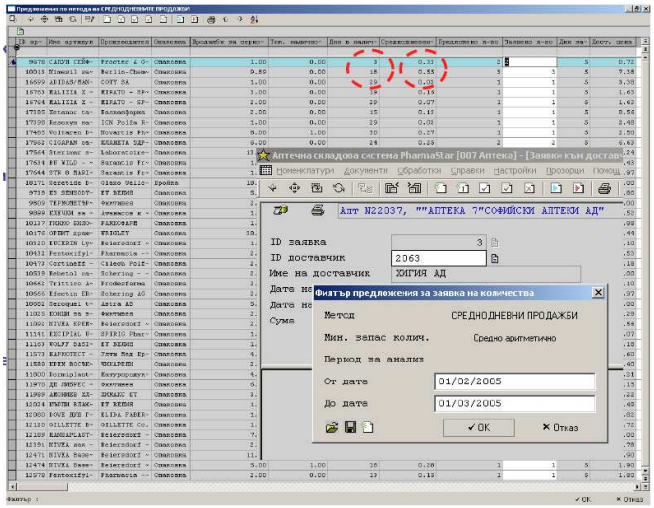


Fig.10. Pharmastar, [17]

The first type of valuation we have selected to use is Evaluation of entrance organization, based on the following six indicators:

1. Tolerance – development of preconditions for adaptation of the IS to the user's habits. Here should be kept in mind all types of entrance information and ways of recording of any concrete event.
2. Mistake stability – the entered information should be subject of every familiar to the authors check and control, so the chance of mistake to be reduced as much as it possible.
3. Entry type unification – every subsystem should enter unified types of information.
4. Eligibility – the user can chose on his own how to present the information at the system entrance
5. Flexibility – the controllers can be assigned from the user.
6. Corrections – the records can be edited after entering.

Evaluation of system entrance organization /1987 [1]

№	Index	Conclusion	Value
1	Toleration	• Entering of data is under defined instruction	0
		• There are more than one methods of entering data	1
		• Ensured all kinds of entrance messages at any step	3
2	Mistake stability	• Not included	0
		• Partial mistake correction and alarms	1
		• Applied all kind of barriers	3
		• The condition above is fulfilled when the mistake is correctly defined	5
		• Repair and mistake diagnosis are done at the same time	10
3	Entry type unification	• no	0
		• partially	1
		• yes all kinds	3
4	Eligibility	• no	0
		• partially	1
		• yes all kinds	3
5	Flexibility	• All kinds of controllers are built in the system	0
		• Part of the controllers are entered manually by the user	3
		• All controllers are entered manually by the user	5
		• The user can choose between built in and personal controllers	10
6	Corrections	• The entered data is not subject of modifications	0
		• Correction is allowed during record of data	1
		• Corrections after the recording	3

In the adapted version the only difference is that in the modernized version we have changed the weight units for the from 0,1,3,5,10 to 0,1,2,3,4. This was prompted by the fact, that if one system has all scores in the mean level, the real value is not the half of the maximum score: 0 + 10 = 10 / 5 = **2** not **3**, which reflect only to a worst evaluation of the system. This problem is eliminated with our change, because: 0+ 4 = 4 /2 = 2 – exactly the intermediate value of both high and low score.

Adapted scheme for evaluation of system entrance organization /2007

№	Index	Conclusion	Value
1	Toleration	• Entering of data is under defined instruction	0
		• There are more than one methods of entering data	1
		• Ensured all kinds of entrance messages at any step	2

2	Mistake stability	• Not included	0
		• Partial mistake correction and alarms	1
		• Applied all kind of barriers	2
		• The condition above is fulfilled when the mistake is correctly defined	3
		• Repair and mistake diagnosis are done at the same time	4
3	Entry type unification	• no	0
		• partially	1
		• yes all kinds	2
4	Eligibility	• no	0
		• partially	1
		• yes all kinds	2
5	Flexibility	• All kinds of controllers are built in the system	0
		• Part of the controllers are entered manually by the user	1
		• All controllers are entered manually by the user	2
		• The user can choose between built in and personal controllers	3
6	Corrections	• The entered data is not subject of modifications	0
		• Correction is allowed during record of data	1
		• Corrections after the recording	2

The maximal score is 15 points, where the weights are grouped in three main functional scales:

- ***0 – 4 points – the developed entrance model should be précised***
- ***5 – 10 points – very good system***
- ***11 – 15 points – modern and reliable system***

Evaluation system for quantity characteristics /1987 [1]

№	Index	Question	Conclusion	Value
1	Effectiveness	Is it enough the date at the entrance for the system to work properly and to persuade all necessary kind of functions?	no	0
			partially	1
			yes	3
2	Reliability	Is it possible for the system to stop unexpectedly?	yes	0
			seldom	1
			incidentally	3
3	Evolution	Is it a module of a bigger one the offered systems?	no	0
			yes with additional work	1
			yes	3
4	Structure flexibility	Is there a possibility to change the structure of the system without changes in the main algorithms?	no	0
			with small exceptions	1
			yes	3

5	Program development level	Is the programming of shell type?	no	0
			only some of the modules	1
			yes	3
6	Program adaptation level	Is it possible to add and extend the software solution?	no	0
			partially	1
			yes all kinds	3
7	Standardization level	On what kind of standards is developed the database?	Adopted in the health center	0
			national	1
			international	3
8	Education	How is the personal educated to work with the system?	Through user guide	0
			Mainly with user guide and with Help menu	1
			Only with Help menu	3
9	Communication	On what type of network can be installed the software?	Only one PC	0
			Local network	1
			All kinds of networks	3
10	Compatibility	Is it admissible to unify the current system with other systems in the healthcare center?	No	0
			With additional efforts	1
			Yes without extra work	3
11	Playing	Is it possible to use the system for simulation and finding a solution of a current problem?	no	0
			partially	1
			yes	3
12	Attractiveness	Is it user friendly and interesting the software interface?	no	0
			partially	1
			yes	3

Adapted evaluation scheme / 2007

№	Index	Question	Conclusion	Value
1	Effectiveness	Is it enough the date at the entrance for the system to work properly and to persuade all necessary kind of functions?	no	0
			partially	1
			yes	2
2	Information type	Is it possible to enter other then textual information in the system?	no	0
			partially	1
			yes	2
3	Evolution	Is it a module of a bigger one the offered systems?	no	0
			yes with additional work	1
			yes	2
4	Archiving	Does the system allow to archive already entered data?	no	0
			only some of the modules	1
			yes	2
5	Security level	Does the system ensure security levels and user passwords?	no	0
			only some of the	1

			modules	
			yes	2
6	Program adaptation level	Is there a possibility to change the structure of the system without changes in the main algorithms?	no	0
			partially	1
			yes all kinds	2
7	Standardization level	Is the programming of shell type?	Adopted in the health center	0
			national	1
			international	2
8	Education	Is it possible to add and extend the software solution?	Through user guide	0
			Mainly with user guide and with Help menu	1
			Only with Help menu	2
9	Communication	On what kind of standards is developed the database?	Only one PC	0
			Local network	1
			All kinds of networks	2
10	Compatibility	How is the personal educated to work with the system?	No	0
			With additional efforts	1
			Yes without extra work	2
11	Playing	On what type of network can be installed the software?	no	0
			partially	1
			yes	2
12	Attractiveness	Is it admissible to unify the current system with other systems in the healthcare center?	no	0
			partially	1
			yes	2

1. Effectiveness is defined as correlation between factors numbers, that are entered in the AMIS and the number of factors that are necessary to make a precise decision.
2. Information type – it concerns the possibility to add different types of information to EHR.
3. Evolution – whether the elaboration of the system could be done without replacement and only with software updates.
4. Archiving – it points out whether the system ensures secure back-ups and archives.
5. Security level – system security passwords and level access.
6. Program adaptation level – it measures the provident possibilities in the software for extension and introduction of modifications
7. Standardization level – characterizes the adopted of the system developers standards of work
8. Education – it reflects the clearness and easy adaptation of the users through additional Menu Helps and User guides
9. Communication – application of the system in a network
10. Compatibility – potential possibility to adapt the system to another working at the center systems.
11. Playing – measures the presence of premises for playing possible doings
12. Attractiveness – effective and effectively user friendly dialogue between the user and the system.

In the adapted version for evaluation, three of the indexes are changed, based on the technological and infrastructure decisions and working models in the modern medical informatics.

The other main difference is again modification of weight units for the maximal score from 3 to 2. This was prompted by the fact, that if one system has all scores in the mean level, the real

value is not the half of the maximum score: 0 + 3 = 3 / 2 = **1.5** not **1**, which reflects only to a worst evaluation of the system. This problem is eliminated with our change, because: 0+ 2 = 2 /2 = 1 – exactly the intermediate value of both high and low score.

The maximal score is 24, and the evaluation is divided into three levels of success:

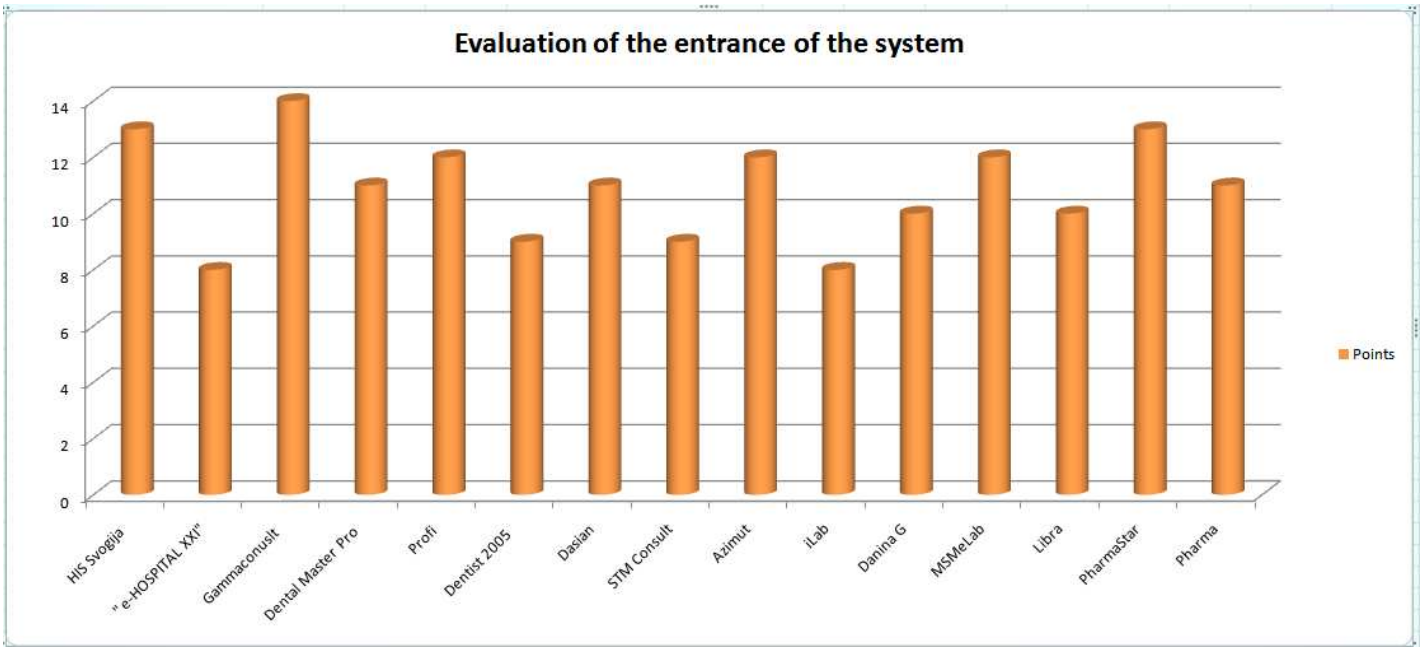
- ***0 – 7 - points – the developed entrance model should be précised***
- ***8 – 15 - points – very good system***
- ***16 – 24 - points – modern and reliable system***

Results

Based on the evaluating schemes and the available information at web resources and Demo versions of the examined software solutions, we have evaluated both the entrance of every system and the complex functionality of the chosen IS.

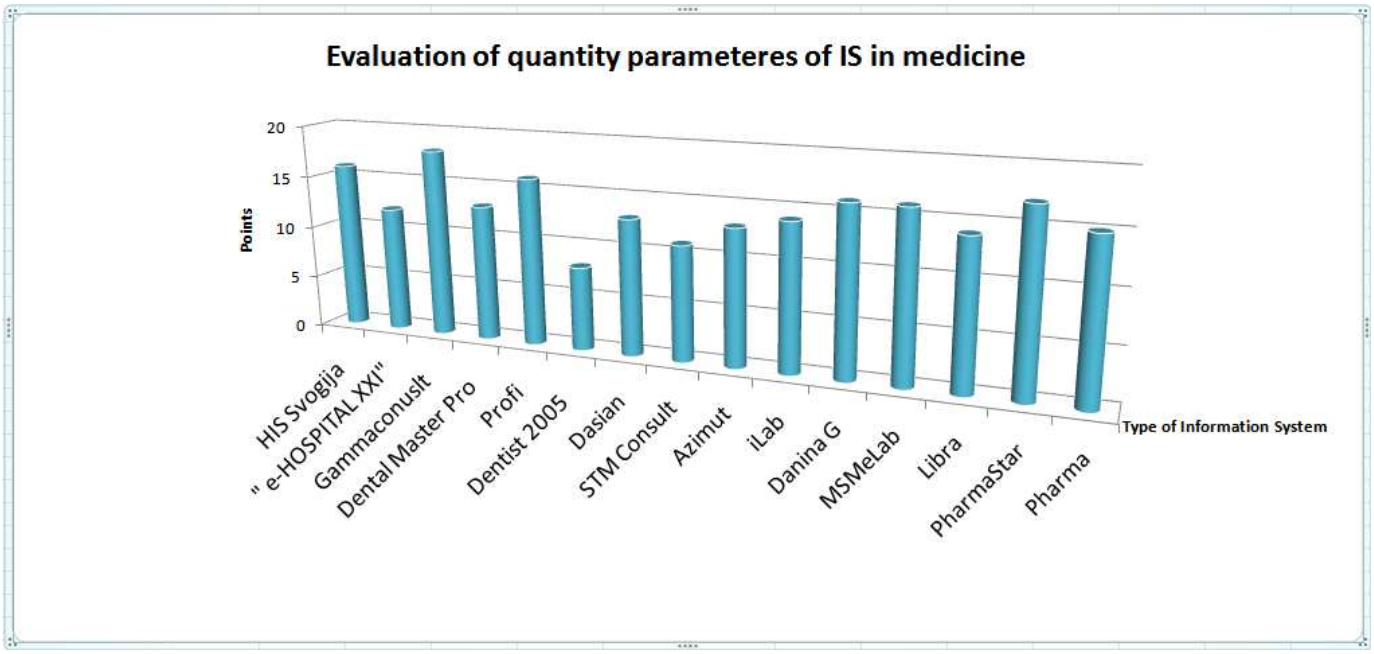
At the table above are the results from Entrance evaluation, followed by the graphical representation.

Type of Information System	**Points**
HIS Svogija	13
" e-HOSPITAL XXI"	8
Gammaconuslt	14
Dental IS:	
Dental Master Pro	11
Profi	12
Dentist 2005	9
IS for occupational services :	
Dasian	11
STM Consult	9
Azimut	12
Laboratory IS:	
iLab	8
Danina G	10
MSMeLab	12
Pharmacy IS:	
Libra	10
PharmaStar	13
Pharma	11



In this table are represented the point projections of the 15 software developments, again followed by the graphic.

Type of Information System	**Points**
HIS:	
1. HIS Svogija	16
2. " e-HOSPITAL XXI"	12
3. Gammaconuslt	18
Dental IS:	
1. Dental Master Pro	13
2. Profi	16
3. Dentist 2005	8
IS for occupational services :	
1. Dasian	13
2. STM consult	11
3. Azimut	13
Laboratory IS:	
1. iLab	14
2. Danina G	16
3. MSMeLab	16
Pharmacy IS:	
1. Libra	14
2. PharmaStar	17
3. Pharma	15



Conclusion

Based on the presented results, we can make the following conclusions:

The evaluation schemes, beyond doubt give us one better concept for the functionality of each IS and in comparison with other famous in the practice systems. Both give us a precise picture for big number of questions, concerning information and entered data management, protections, security, corrections and editing, easiness in adaptation and updating of the current situation, and one of the most important parameters user-friendly interface.

Another interesting fact is that no matter the differences in parameters, weights and evaluation criteria for entrance and quantity evaluations, both present similar conclusions.

For the Hospital Information Systems Gammaconuslt is the most modern and reliable.

For the Dental Information Systems is Profi.

At the top for occupational services are two of the three chosen software solutions – Dasian and Azimut.

In the Laboratory IS the situation is similar, we have Danina G and MSMeLab with equal final results.

PharmaStar is with highest results for Pharmacy software.

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